

What is claimed is:

1 1. An optical cross-connect apparatus, comprising:
2 a light switch having n (n is a natural number of 2 or
3 more) pieces of first port and at least $(n + 1)$ pieces of second
4 port, which switches paths of light signals inputted from each
5 of said first ports and has them outputted from any one of
6 said second ports;
7 a light path control section for branching a path of said
8 light switch so as to have light signals inputted from any
9 one of said first ports outputted from any two of said second
10 ports; and
11 a light signal supervising section for supervising
12 quality of light signals outputted from either of said two
13 ports.

1 2. An optical cross-connect apparatus, according to claim 1
2 further comprising:
3 a light amplifying section for amplifying light signals
4 outputted from either of said two ports; wherein
5 the light signal supervising section for supervising
6 quality of light signals amplified by this light amplifying
7 section.

1 3. An optical cross-connect apparatus, comprising:
2 a light switch having a plurality of first and second
3 ports, which switches paths of light signals inputted from

4 each of said first ports and has them outputted from any one
5 of said second ports;

6 a light path control section for branching a path of said
7 light switch so as to have light signals inputted from any
8 one of said first ports outputted from any two of said second
9 ports when supervising said light signals and have light
10 signals inputted from each of said first ports outputted from ^{the}
11 predetermined one of said second ports when not supervising
12 said light signal;] and

13 a light signal supervising section for supervising
14 quality of light signals outputted from either of said two
15 ports only when performing said supervising.

1 4. An optical cross-connect apparatus, comprising:

2 a wavelength separating section for separating, per
3 wavelength component, wavelength multiple light wherein light
4 signals of a plurality of mutually different wavelength
5 components are multiplexed;

6 a light switch having n (n is a natural number of 2 or
7 more) pieces of first port and at least (n + 1) pieces of second
8 port, which switches light signals of the respective wavelength
9 components separated by said wavelength separating section
10 inputted from each of said first ports and has them outputted
11 from any one of said second ports;

12 a light path control section for branching a path of said
13 light switch so as to have light signals inputted from one
14 of said first ports outputted from any two of said second ports;

15 a light signal supervising section for supervising
16 quality of light signals outputted from a predetermined third
17 port of said two ports;

18 a wavelength component converting section for converting
19 each individual light signal outputted from said second ports
20 excluding said third port into a light signal of predetermined
21 wavelength components; and

22 a wavelength multiplexing section for multiplexing per
23 predetermined number these light signals converted by the
24 wavelength component converting section.

1 5. The optical cross-connect apparatus according to claims
2 , wherein said light signal supervising section detects and
3 supervises management information placed in an overhead
4 section of a predetermined frame format.

1 6. The optical cross-connect apparatus according to claim
2 5, wherein said light path control section sets a path for
3 having light signals to be supervised inputted from each port
4 outputted from said two ports per port in order.

1 7. The optical cross-connect apparatus according to claims
2 3 , wherein said light signal supervising section detects and
3 supervises management information placed in an overhead
4 section of a predetermined frame format.

1 8. The optical cross-connect apparatus according to claim
2 7, wherein said light path control section sets a path for
3 having light signals to be supervised inputted from each port
4 outputted from said two ports per port in order.

1 9. The optical cross-connect apparatus according to claims
2 4, wherein said light signal supervising section detects and
3 supervises management information placed in an overhead
4 section of a predetermined frame format.

1 10. The optical cross-connect apparatus according to claim
2 9, wherein said light path control section sets a path for
3 having light signals to be supervised inputted from each port
4 outputted from said two ports per port in order.

1 11. An optical cross-connect apparatus, comprising:
2 a light switch having a plurality of first and second
3 ports, which switches paths of light signals inputted from
4 each of said first ports and has them outputted from any one
5 of said second ports and also switches paths of light signals
6 inputted from each of said second ports and has them outputted
7 from any one of said first ports;
8 n pieces of upward light signal input and output terminals;
9 n pieces of downward light signal input and output
10 terminals;
11 a first light circulator provided corresponding to each
12 of said first ports for outputting upward light signals

13 inputted from each of the upward light signal input terminals
14 to each corresponding port of said first ports and also
15 outputting downward light signals inputted from each of said
16 ports to said downward light signal output terminal;

17 a second light circulator provided corresponding to each
18 of said second ports for outputting downward light signals
19 inputted from each of the downward light signal input terminals
20 to each corresponding port of said second ports and also
21 outputting upward light signals inputted from each of said
22 ports to said upward light signal output terminal;

23 a light path control section for branching a path of said
24 light switch means so as to have light signals inputted from
25 any one of said first ports outputted from any two of said
26 second ports and also have light signals inputted from any
27 one of said second ports outputted from any two of said first
28 ports;

29 a first light signal supervising section for supervising
30 quality of light signals outputted from a predetermined third
31 port of any two of said first ports; and

32 a second light signal supervising section for supervising
33 quality of light signals outputted from a predetermined fourth
34 port of any two of said second ports.

1 12. The optical cross-connect apparatus according to claim
2 11, wherein said first and second light signal supervising
3 sections detect and supervise management information placed
4 in an overhead section of a predetermined frame format.

1 13. The optical cross-connect apparatus according to claim
2 11, wherein said light path control section sets a path for
3 having light signals to be supervised inputted from any first
4 or second port outputted from any two of said second or first
5 ports per port in order.

1 14. The optical cross-connect apparatus according to claim
2 12, wherein said light path control section sets a path for
3 having light signals to be supervised inputted from any first
4 or second port outputted from any two of said second or first
5 ports per port in order.

1 15. A signal supervising method, comprising the steps of:
2 a light switching of switching paths of light signals
3 inputted from each of n (n is a natural number of 2 or more)
4 pieces of first port and outputting them from any of at least
5 (n + 1) pieces of second port;
6 a light path controlling of branching a path of said light
7 switch so as to have light signals inputted from one of said
8 first ports outputted from any two of said second ports;
9 a light signal supervising of supervising quality of light
10 signals outputted from either of said two ports.

1 16. A signal supervising method according claim 15, further
2 comprising the steps of:

3 a light amplifying of amplifying light signals outputted
4 from either of said two ports; wherein
5 the light signal supervising of supervising quality of
6 light signals amplified by this light amplifying process.

1 17. A signal supervising method, comprising the steps of:
2 a light switching of switching paths of light signals ~~by~~
3 inputted from each of a plurality of first ports and having
4 them outputted from any one of a plurality of second ports;
5 a light path controlling of branching a path of said light
6 switch so as to have light signals inputted from any one of
7 said first ports outputted from any two of said second ports
8 when supervising said light signal and have light signals
9 inputted from each of said first ports outputted from
10 predetermined one of said second ports when not supervising
11 said light signal; and
12 a light signal supervising of supervising quality of light
13 signals outputted from either of said two ports only when
14 performing said supervising.

1 18. A signal supervising method, comprising the steps of:
2 a wavelength separating of separating, per wavelength
3 component, wavelength multiple light wherein light signals
4 of a plurality of mutually different wavelength components
5 are multiplexed;
6 a light switching of switching light signals of the
7 respective wavelength components separated by said wavelength

8 separating process inputted from each of n (n is a natural
9 number of 2 or more) pieces of first port and having them
10 outputted from any one of at least $(n + 1)$ pieces of second
11 port;

12 a light path controlling of branching a path of said light
13 switch so as to have light signals inputted from one of said
14 first ports outputted from any two of said second ports;

15 a light signal supervising of supervising quality of
16 light signals outputted from a predetermined third port of
17 said two ports;

18 a wavelength converting of converting each individual
19 light signal outputted from said second ports excluding said
20 third port into a light signal of predetermined wavelength
21 components; and

22 a wavelength multiplexing of multiplexing per
23 predetermined number these light signals converted by the
24 wavelength component converting process.

1 19. The signal supervising method according to claims 15 ,
2 wherein said light signal supervising process detects and
3 supervises management information placed in an overhead
4 section of a predetermined frame format.

1 20. The signal supervising method according to claims 19,
2 wherein said light path control process sets a path for having
3 light signals to be supervised inputted from each port
4 outputted from said two ports per port in order.

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1 21. The signal supervising method according to claims 17 ,
2 wherein said light signal supervising process detects and
3 supervises management information placed in an overhead
4 section of a predetermined frame format.

1 22. The signal supervising method according to claims 21,
2 wherein said light path control process sets a path for having
3 light signals to be supervised inputted from each port
4 outputted from said two ports per port in order.

1 23. The signal supervising method according to claims 18 ,
2 wherein said light signal supervising process detects and
3 supervises management information placed in an overhead
4 section of a predetermined frame format.

1 24. The signal supervising method according to claims 19,
2 wherein said light path control process sets a path for having
3 light signals to be supervised inputted from each port
4 outputted from said two ports per port in order.